

## **Flood research from the social perspective: the case of the Tisza River in Hungary**

**ANNA VÁRI & ZOLTÁN FERENCZ**

*Hungarian Academy of Sciences Institute of Sociology, Uri. U. 49, 1014 Budapest, Hungary*  
[anna.vari@ella.hu](mailto:anna.vari@ella.hu)

**Abstract** The frequency and intensity of floods as well as the magnitude of their damage have increased throughout the world during the past decade. Governments face the difficult task of developing suitable prevention and mitigation strategies and strengthening the resilience of the population. Feasible strategies must meet technical, social and political requirements, and, at the same time, must not exceed the given country's capacity to cope. In response to increasing flood losses in Hungary, between 1999 and 2003, both the Hungarian government and international funding organizations commissioned a number of empirical research studies focusing on public views on floods. One of their aims was to explore the main sources of information on flood hazard and the level of knowledge useful in a crisis situation. Another aim was to learn what the various population groups think of the most important causes and consequences of flood damages and the role of the various actors. Public attitudes towards various prevention and mitigation strategies, as well as sources of emerging conflict (e.g. regarding the siting of emergency reservoirs) were also revealed. The paper presents the most important results of the above investigations. One of the most important findings was that in many respects the views of the public differ from those of the elite groups, especially the water management experts. This underlines the importance of having the alternative flood risk management policies studied not only from the perspective of technical rational, but also from that of social acceptability, before any decision is made.

**Key words** alternative flood risk management; empirical research; flood prevention and mitigation; public attitude; social acceptability

### **Perspective sociale de la recherche sur les crues: Le cas de la rivière Tisza en Hongrie**

**Résumé** La fréquence et l'intensité des crues, de même que l'importance des dommages ont augmenté de par le monde au cours de la dernière décennie. Les gouvernements doivent faire face à la tâche difficile consistant à développer des stratégies de prévention et de d'atténuation adaptées et à renforcer les capacités de résistance de la population. Les stratégies envisageables doivent satisfaire des contraintes techniques, sociales et politiques, mais ne doivent pas dépasser les capacités du pays. Entre 1999 et 2003, en réponse à la croissance des dommages dus aux inondations, le gouvernement hongrois et des organismes internationaux de financement ont commandé un certain nombre de recherches empiriques consacrées à l'opinion du public sur les inondations. L'un des leur buts était de déterminer l'origine principale de l'information sur le risque d'inondation et le niveau de connaissance utile en situation de crise. Un autre objectif était de déterminer ce que les différents groupes de la population pensaient des principales causes et conséquences des dommages dus aux inondations ainsi que du rôle des différents acteurs. On a également pu connaître l'attitude du public vis à vis de

différentes stratégies de prévention et d'atténuation et déterminer des sources de conflits potentiels (par exemple à propos de la localisation de réservoirs d'urgence). L'article présente les principaux résultats de l'ensemble de ces recherches. L'une des découvertes les plus importantes est, qu'à bien des égards, les opinions du public diffèrent de celles de certaines élites, en particulier de celles des experts en gestion des eaux. Cela souligne qu'avant de prendre quelle que décision que ce soit, il est important d'étudier les variantes de la politique de gestion du risque inondation non seulement sous l'angle de leur rationalité technique mais aussi sous celui de leur acceptabilité sociale.

**Mots clefs** inondation; stratégies de prévention et de d'atténuation; recherches empiriques; attitude du public; acceptabilité sociale; politique de gestion du risque.

## INTRODUCTION

The frequency and intensity of floods as well as the magnitude of the damage caused, have increased throughout the world during the past decade. Governments face the difficult task of developing suitable prevention and mitigation strategies and strengthening the resilience of the population. Feasible strategies must meet technical, social and political requirements, and, at the same time, must not exceed the given country's capacity to cope. Our study shows, in connection with floods on the Tisza River, how research focusing on social perspectives assists policy decisions in Hungary.

Located in the Carpathian basin, Hungary is one of the Central European countries most exposed to risk from floods. In addition to riverine flooding, floods from standing waters in low-lying regions and flash floods in the hilly areas are also frequent. Over half (52%) of the country's territory, 1500 communities, two-thirds of Hungary's arable land, 32% of its railways and 15% of its roads are exposed to flood hazards. Estimates have shown that losses from flooding could reach almost a quarter of the GDP that is produced in river flood basins, or 7–9% of the total GDP of the country.

The vulnerability of Hungary is aggravated by the fact that almost all of its rivers originate abroad and the country has very little control over the developments implemented in upstream countries. For example, changes in land use, primarily deforestation in upstream countries, have had detrimental impacts on the dynamics of recent floods. Today, woodedness in the Transcarpathian region—a zone of constant risk of excessive flood formation on the Tisza River—amounts to approximately 52% while it was about 95% before human interference (Pecher *et al.*, 1999).

One of the highest flood risk areas in Hungary is the Tisza River basin, and particularly its northeastern part, the Upper Tisza basin. The intensity and frequency of flood disasters in this region appear to be increasing due to development and farming practices in the flood-exposed areas, deforestation and other land-use practices, the regulation of the river, and neglect of the drainage systems. Worsening weather extremes due to climate change may also be a contributing factor. Since 1998, record-breaking river water levels have occurred, but the extensive network of levees prevented major losses until 2001 when the flood burst through the protective levees and caused extensive damage in the Bereg region.

In Hungary, flood prevention, mitigation, and emergency management have traditionally been the responsibility of the National Water Authority and 12 regional

water management directorates. During the socialist-state period, the water management authorities established a strong hierarchical system with a staff of approximately 30 000, but after the political transition this system was significantly reduced to approximately 4000 persons and several tasks (e.g. maintenance of smaller dykes and municipal drainage systems) were assigned to local governments. However, local authorities do not possess sufficient funding and expertise to meet these responsibilities. They are increasingly building on local capacities, especially the skills of their residents.

With increasing losses from floods, the Hungarian government has become concerned about its escalating expenditure for flood prevention, flood response, compensation to victims, and public infrastructure repair. A series of research studies were launched to investigate alternative mitigation strategies from the hydrological, economic and social perspectives. For example, within the framework of a World Bank-sponsored project, a feasibility study and master plan for flood control in Hungary was prepared in 1999 (Halcrow Water, 1999). This master plan addressed issues of mitigation and financing on the part of the public and private sectors. The main project recommendation was that Hungary should develop a priority system for constructing additional flood levees based on cost–benefit analysis. Detailed flood risk analysis and mapping were also strongly recommended as tools for enhancing public awareness. However, in 2001, after the levee breach in the Upper Tisza (Bereg) region, the government decided to change its strategy focusing mostly on heightening and strengthening the levee system. It set the aim of continuing the development of the one and a half century old Tisza River regulation plan associated with Pál Vásárhelyi. The essence of the concept of the New Vásárhelyi Plan is a far more complex prevention strategy involving, besides the heightening of levees, increasing the conveyance capacity of the riverbed, on the one hand, and the utilization of some parts of the protected flood plain for channeling flood waves (Váradi, 2001).

Between 1999 and 2003, the Hungarian Academy of Sciences Institute of Sociology—partly commissioned by government agencies and partly within the framework of international investigations—conducted a series of empirical research studies focusing on public views on floods (Rozgonyi, 2000; Tamás, 2000; Vári, 2002; Vári *et al.*, 2003; Ferencz, 2004). One of their aims was to explore the main sources of information on flood hazard and the level of useful knowledge in a crisis situation. Another aim was to learn what the various population groups think of the most important causes and consequences of flood damages, and the role of the various actors. Public attitudes toward various prevention and mitigation strategies, as well as sources of emerging conflicts (e.g. around the siting of emergency reservoirs) were also revealed. The research results enable comparison of the views of those living in the low- and high-risk areas of the Tisza Valley and in other parts of the country, as well as an examination of tendencies over time.

The research included the following studies:

- March 1999: Survey in two Upper Tisza (high-risk, rural) regions and one Lower Tisza (low-risk, urban) regions. Sample: 250–250 local residents (750 in total).
- March 2001: Survey in one Upper Tisza (high-risk, rural) region, one Middle-Tisza (high-risk, urban) region and two Transdanubian (rural and urban) regions not affected by flood. Sample: 100–100 local residents (400 in total).

- March 2002: Survey along the Tisza Valley (both high- and low-risk, urban and rural regions). Sample: 2200 inhabitants.
- April 2002: Survey among elite groups along the Tisza Valley (political, economic, cultural and water management elites). Sample: 200–200 individuals (800 in total).
- May 2003: National survey. Sample: 1000 individuals.

The most important results of the above research projects are summarized in this paper.

## RESULTS OF THE 1999 SURVEY

The 1999 survey was conducted within the framework of the project titled Flood Control Development in Hungary (Halcrow Water, 1999), initiated by the Ministry for Transportation, Communication, and Water Management (sponsored by the World Bank). The purpose of the survey was to investigate public knowledge and attitudes regarding flood risk, with special attention to issues of emergency management. The survey, carried out in March 1999, included one (low-risk) flood basin in the Lower Tisza region (this flood basin is located around the city of Szeged, and includes some of its suburbs; it has not been seriously flooded since 1872 and has not been endangered by recent floods), as well as two (high-risk) flood basins in the Upper Tisza region, the Palád-Csécse and the Szamosköz basins. The sample size in each flood basin was 250 individuals. The sample is representative in terms of households (Vári, 2002).

### Knowledge about flood risk and its management

First, it was expedient to find out *from what information sources the public would learn about the danger of an approaching flood*. Table 1 shows what percentage of the respondents mentioned certain information sources in the three basins. It is apparent that the structure of communication differs in the basins of the Upper- and the Lower Tisza. In the Upper Tisza region, the public learns about the danger primarily from local government personnel, e.g. the mayor, notary, and other elected officials or employees. The figure is somewhat lower for the local, non-official sources, while the percentage of mention of all other sources is quite low. The situation is different in the

**Table 1** From what information source would you be likely to learn about the danger? (%).

Information source	Lower Tisza	Palád-Csécse	Szamosköz	Full Sample
Local government personnel	35	65	73	58
Local non-official source	33	45	28	36
Central media	31	9	7	16
Local media	8	2	5	5
Civil protection	7	5	1	4
Police	1		1	1
Other	10	1	3	4

Lower Tisza basin. Here the frequency of mention of local government personnel, local non-official sources and central media is nearly equal (35%, 33% and 31%). In this region, the public counts on the local media and on civil protection organizations to a greater extent than in the Upper Tisza region. The appreciation of local government sources of information in the basins of the Upper Tisza may be due primarily to the fact that here the local authorities played a leading role in resolving the 1998 and 1999 emergencies related to flooding and standing water and they were the main source of information in these situations.

The following, open-ended, question concerned whether the respondent knew *what to do in case of flood*. Table 2 shows the percentage of the respondents who mentioned activities to be performed by themselves (e.g. participating in rescue operations, moving, etc.), who mentioned activities to be performed with outside help (e.g. evacuation organized by the local authorities), and who mentioned both types of activities. It appears that the percentage of those acting by themselves is the highest in the Lower Tisza basin while the percentage of those who would act both by themselves and with outside help is the highest in the basins of the Upper Tisza. This may be related to the fact that those in high-risk areas are more likely to recognize the need for cooperation with others in emergencies.

**Table 2** Do you know what to do in the case of a flood? (%).

Action	Lower Tisza	Palád-Csécse	Szamosköz	Full Sample
Individual action	44	24	35	34
With outside help	2	5	6	4
Both	48	70	57	58
Other	6	3	3	4

To the question: *Have you heard about the plans for the settlement's protection and evacuation?* 50% of the sample answered in the affirmative. In this respect there is hardly any difference in the three basins. Men tend to be more familiar with the plans for rescue and evacuation than women; while 55% of the men said they have heard about the plans, only 46% of the women stated the same. The level of familiarity increases with the level of education.

The picture is less rosy when the question concerned the *details of the plans*. It appears that only 8% of the respondents have a thorough knowledge of the plans while 31% admit partial knowledge. The proportion of those familiar with the plan is highest in the Szamosköz basin (15%) and lowest in the Lower Tisza basin (2%). At the same time, the percentage of those unable to give any information about the plan is highest in the Lower Tisza basin (76%) and lowest in the Palád-Csécse basin (50%).

To the question: *Is your knowledge sufficient for taking action in a real emergency?* 56% of the full sample said "yes," 8% said "partly sufficient," and 16% said "no". In spatial distribution, the answers, however, are quite different: only 17% of the respondents in the Lower Tisza basin considered their knowledge sufficient, while in the Palád-Csécse basin this proportion is 85% and in Szamosköz basin 67% (Table 3). This is probably due to the recent emergency situations in the Upper Tisza basins (particularly in the Palád-Csécse basin), and the lack of similar experiences in the Lower Tisza region.

**Table 3** Is your knowledge sufficient for taking action in a real emergency? (%).

	Lower Tisza	Palád-Csécse	Szamosköz	Full Sample
Yes	17	85	67	56
Partly	12	4	7	8
No	27	8	12	16
Does not know	45	3	13	20

An interesting outcome is that increasing education levels correlate with decreases in the proportion of those who consider their knowledge sufficient for taking proper action in a real emergency. On the one hand, this can be related to the fact that the level of education is lower in the high-risk basins of the Upper Tisza where people have more experience with flood than in the Lower Tisza region. Another explanation may be that those with higher level of education are likely to be more aware of the insufficiency of their knowledge.

### Perceived risk and past experience

The following questions are related to the perceived magnitude of flood risk in the area where the respondent was living. The first concerned *the probability of flooding due to a levee failure* over the next year. A further question concerned *the probability of flooding because the water level is higher than the level of the existing levee*. Results are shown in Tables 4 and 5, and indicate that there are significant groups of people who feel highly endangered, especially in the Upper Tisza region.

Inhabitants of the Palád-Csécse basin, who were most endangered (but not flooded) in November 1998, perceive both the risk of levee failure and that of levee overtopping the highest. Less concerned are those residing in the Szamosköz basin, although the latter had to face a levee breach in 1970, while inhabitants of the Lower Tisza basin find it the least likely that their area would be flooded. This result suggests that the freshness of flood experiences is a more important factor in the perceived probability

**Table 4** Probability of future flooding, as a consequence of levee failure (the division of probability categories according to regions, %).

	Lower Tisza	Palád-Csécse	Szamosköz	Full Sample
Below 25%	84	38	69	64
26–50%	13	28	23	21
Above 51%	3	34	8	15

**Table 5** Probability of flood due to levee overtopping (division of probability categories according to regions, %).

	Lower Tisza	Palád-Csécse	Szamosköz	Full Sample
Below 25%	90	32	60	60
26–50%	9	36	18	21
Above 51%	2	32	22	19

of a catastrophic event than the seriousness of expected floods. This corresponds to findings in decision research, according to which the ease of recall from memory increases estimated probabilities (see the so called “availability heuristic” identified by Tversky & Kahneman, 1973).

Next, *the importance of personal experience* in people’s responses was analysed. When respondents were asked if they had ever experienced a flood personally, it was found that overall, the number of people affected was highest in the Szamosköz basin (60% of the respondents had personally experienced at least one flood event), and much lower in the Palád-Csécse and the Lower Tisza basin (38% and 34%, respectively). Among the survey variables, the one which has a significant relationship with personal experience is the answer to the question: *Is your knowledge sufficient for taking action in a real emergency?* Table 6 indicates that those who have personally experienced flood are more likely to feel competent to take action than those who do not have this experience. This finding corresponds to research results according to which experience with past flooding is one of the best predictors of those residents who take protective action (O’Brien & Payne, 1997).

**Table 6** Is your knowledge sufficient for taking action in real emergency? (%).

	Has personal experience of flood	Has no personal experience of flood	Total sample
Yes	73	67	70
Partly	10	10	10
No	17	23	20

## RESULTS OF THE 2001 SURVEY

The 2001 survey was part of the research project titled Integrated Flood Risk Management in the Upper Tisza Basin, coordinated by the International Institute for Applied Systems Analysis (IIASA) and co-sponsored by the Swedish FORMAS. The purpose of the survey was to elicit the views of the public on Hungary’s options for reducing flood risks (Vári *et al.*, 2003). Four regions were chosen to include people living in high-risk and low-risk, rural and urban areas. Two of these regions are located along the Tisza River, the upstream Palád-Csécse flood basin and the city of Szolnok in the Middle-Tisza area. The other two areas are located in the west of Hungary in areas where there is little risk of flooding: a rural area in the hilly Zala county and the city of Székesfehérvár. The sample size in each area was 100. The sample was selected to be representative in terms of gender and age for each region.

### Views about the causes and consequences of floods

Respondents were asked to choose the four *most important causes of increasing flood losses* in Hungary from a list of 11 options. Table 7 shows the most frequent answers, which included the improper maintenance of the levees, the clearing of large forest areas in the catchment area, and the insufficient height and strength of the levees.

**Table 7** What are the main causes of increasing flood losses in Hungary?

Causes	Chosen by (%)
Poor maintenance of levees	73
Clearance of forests	63
Levees not sufficiently high and strong	57
Neighbouring countries taking insufficient measures	46
Global climate change causing intensified rainfall and snowmelt	42
Building permits issued in high-risk areas	34
Weakened water management authorities	21
River regulation	20
Poor warning systems	12
People building in high flood-risk areas	10
Insufficient private mitigation measures	8

Almost half of the interviewees implicated neighbouring countries and global climate change as among the main reasons for increasing flood losses. Significantly, the least importance was attributed to insufficient preventive measures or to building in flood-risk areas by the local population. At the same time, a third of the respondents blamed the authorities for having issued building permits in areas with high flood risk. These results indicate that Hungarians tend to blame their government or neighbouring countries for the country's escalating flood losses, and only a few appear to hold those living and working in the high-risk areas as contributing substantially to this escalation.

There were regional differences in these responses. Those living in the high-risk areas, and especially residents of the Palád-Csécse basin, attach less blame to the Hungarian authorities for the insufficiency of the levees and for their failure to restrict building; they attach more blame to ecological factors such as climate change and to deforestation in the upstream countries. The series of record-breaking water levels between 1998 and 2001 in this region may explain this response.

Next, respondents were asked to rank the three *most serious consequences of floods* from a list of nine. As shown in Table 8, more than half of the respondents considered the damages to homes, summer houses and other property as the most serious consequences. Somewhat fewer respondents emphasized the disablement of farming activities and the distress of the flood victims, and the least frequent responses included the decrease in tourism and the decrease in property values.

**Table 8** What are the most serious negative consequences of floods in Hungary?

Consequences	Chosen by (%)
Homes, summer houses and property are damaged	58
Farming activities become impossible	45
People are distressed and often become ill	45
Roads, utilities, and public buildings are damaged	40
Pollution is spread by flood waters	37
The ecosystem becomes unbalanced	31
The income from farming activities becomes highly uncertain	25
Property values decrease in the endangered areas	12
Tourism declines	4



Residents of the Palád-Csécse basin put significantly more emphasis on damages to houses and summer houses (78%), impacts on the health of victims (58%) and disablement of farming activities (56%) than respondents in the other three regions. Those living in the two rural areas attributed greater significance to the contamination of the inundated areas (37% and 46% in the Palád-Csécse and the Zala region, respectively), while those living in urban centres put more emphasis on damages to public buildings and roads (53% and 50% in Szolnok and Székesfehérvár, respectively) and the resulting imbalance of the ecosystem (44% and 38%, respectively).

### Preferences regarding mitigation strategies

When asked whether anything could be done to reduce flood losses, only 9% of the respondents responded negatively. Table 9 shows the most frequent answers to the question of *what measures would be most effective in reducing flood losses* (a maximum of three measures could be selected from a list of eleven). The most frequently selected measures included heightening and strengthening the existing levees and reforestation in the catchment area. Maintenance and reconstruction of the drainage systems as well as preventing construction in high-risk areas were selected at a lower frequency. Twenty-one percent of the respondents considered the removal of selected levees as an important mitigation measure, which is significant considering that this measure is a radical departure from the traditional policy of protecting the settlements with levees. Lower rankings were given to other alternative measures, such as informing the public, financial incentives to encourage inhabitants to migrate out of high-risk areas, introducing alternative agricultural practices, re-naturalization of parts of the river and support of the water management authorities.

The rankings show little regional deviation with regard to the most popular mitigation measure of improving (heightening and strengthening) the levees, but there is more deviation regarding other measures. Reforestation is particularly emphasized in the settlements along the Tisza River, both in the Palád-Csécse region and in Szolnok, whereas removal of selected levees to increase the flood plain is, not surprisingly, most emphasized in downstream Szolnok. It is also not surprising that persons living in areas less affected by floods prefer preventing construction in flood plains.

**Table 9** What measures do you think would be most effective for reducing flood losses in Hungary?

Measures	Chosen by (%)
Heightening and strengthening the existing levees	74
Reforestation in the catchment area	61
Maintenance of the drainage systems	45
Preventing construction in high-risk areas	27
Removing levees to increase catchment areas	21
Development of forecasting and warning systems	21
Provision of more resources to water management authorities	16
Financial support for transferring people out of high-risk areas	14
Informing the public about flood risks and their mitigation	10
Introducing appropriate agricultural activities	9
Re-naturalization of parts of the river	6

The respondents were asked to give their opinion on *who should take the most responsibility for reducing flood losses*. The responses strongly indicate that the public believe that responsibility should be mainly in the hands of the central government rather than in the hands of property owners living in high-risk areas. The central government was ranked in first or second place (of four alternatives) by 92% of the respondents, the neighbouring countries by 51%, the municipalities by 49% and the property owners by only 10% of the respondents. Although respondents from all the sample regions consider the role of the central government as the most important, significantly fewer in the Palád-Csécse region ranked the central government as carrying most responsibility, and significantly more respondents in this region ranked the upstream countries as being mainly responsible. The role of the municipalities and the property owners is considered somewhat more important in the cities (Szolnok and Székesfehérvár) than in the rural regions, perhaps because of the extreme financial problems facing smaller communities.

Given the strong public perception that flood problems in the Upper Tisza region are greatly aggravated by deforestation and other practices in upstream Ukraine and Romania, a question asking *how these countries would finance mitigation measures* was included. Interestingly, as shown in Table 10, the vast majority (80%) of the respondents thought that Hungary should help finance flood protection investments in the upstream countries. This might include, for example, the construction of levees in Romania and the Ukraine. Support was somewhat stronger in rural areas.

**Table 10** To what extent should the Hungarian government pay for risk-reducing investments in upstream countries?

	Palád-Csécse	Szolnok	Zala	Székesfehérvár	Total
Fully (%)	32	35	35	45	37
Partly (%)	45	44	43	38	43
Rather not (%)	7	19	13	17	14
Do not know (%)	16	2	9	0	6

## RESULTS OF THE 2002 AND 2003 SURVEYS

The aim of the 2002 and 2003 surveys, commissioned by the Ministry for Environmental Protection and Water Management and the National Water Authority, respectively, was to explore the views concerning floods, various mitigation measures and the New Vásárhelyi Plan. The investigations were based on regional and national surveys, representative in terms of age, gender, educational level and settlement structure. The 2002 survey used a sample of 2200 respondents in the Tisza Valley, while the 2003 survey was based on a national sample of 1000 respondents. In addition, in May 2002 four elite groups from the Tisza Valley (political, economic, cultural and water management elites) were also questioned, specifically on issues related to the New Vásárhelyi Plan. The findings of these surveys were compared with each other, as well as with the results obtained for similar questions in previous studies.

### Views on the causes of floods and possible mitigation measures

Table 11 shows the comparison of the results of the 2001 survey concerning *the causes of floods* (in a breakdown by “Tisza region” and “Non-affected” sub-samples) with the findings of the 2002 Tisza Valley survey and the 2003 national survey. Since there were some minor differences in phrasing and the number of possible answers, between the surveys, only the overlapping causes and their rankings were compared. It is noteworthy that in both Tisza Valley samples, deforestation in the catchment area (which is a problem primarily across the border) was ranked first, considerably preceding the neglected building and maintenance of levees deemed the most serious (domestic) problem by non-resident respondents. Another interesting trend involves a change over time. While in 2001 the respondents attributed a relatively great importance to the weakening of the water authority, its staff reduction and deteriorating equipment, and deemed the passivity of the local population a much less important factor, in 2002–2003, the order reversed and the weight of the helplessness of the population increased. It is also interesting that, as opposed to the local residents along the Tisza, the general public deemed the low efficiency of the forecasting and warning systems to be a relatively important factor. The reason may be that non-residents were less likely to know than the local population that these forecasting and warning systems had already been mostly installed along the Tisza River.

**Table 11** Reasons for increasing flood losses, 2001–2003 (%).

Reasons	Non-affected regions 2001	Tisza regions 2001	Tisza Valley 2002	National sample 2003
Poor maintenance of levees	77	68	NA	86
Levees not sufficiently high and strong	64	50	56	82
Clearance of forests	51	76	72	79
Global climate change causing intensified rainfall and snowmelt	37	47	48	65
Insufficient private mitigation actions/weakening local capacities	9	7	38	38
Weakened water management authorities	22	20	16	37
Poor warning systems	14	10	8	37

The “Tisza region” sub-sample includes the sum of the data collected in the Upper Tisza and Szolnok regions, while the “Non-affected” sub-sample contains the sum of the Zala and Székesfehérvár samples.

The data in Table 12 give a clear picture of the *perceived impacts of floods*. We can see that the results of the Tisza Valley sample differ considerably from those of the national survey with respect to the impact on the individual’s life and on the settlement. The impact on individual life was considered more significant in the Tisza Valley than by the national sample, but even the former deemed it as relatively small. The impact on the settlement was also deemed more serious in the Tisza Valley sample, and the difference between the two samples is also the greatest in this respect. The results for the impact on the country as a whole are identical, moreover this dimension was judged to be the most serious.

**Table 12** The impacts of recent floods on (0–100).

Impacts on:	Tisza Valley 2002	National sample 2003
Your life	38	13
Your settlement	57	19
The country as a whole	73	73

**Table 13** Most effective mitigation measures, 2001–2003 (%).

Measures	Non-affected regions 2001	Tisza regions 2001	Tisza Valley 2002	National sample 2003
Heightening and strengthening the existing levees	78	70	73	89
Maintenance of the drainage systems	48	32	56	82
Reforestation in the catchment area	50	73	73	77
Removing levees to increase catchment areas	13	30	17	75
Development of forecasting and warning systems	21	15	21	60
Provision of more resources to water management authorities	13	15	34	58
Informing the public about flood risks and their mitigation	6	12	13	57
Introducing appropriate agricultural activities	5	11	14	41
Financial support for transferring people out of high-risk areas	17	8	20	35

Table 13 presents the views concerning the *most effective flood loss mitigation measures* in a breakdown by survey. In this case, too, due to changes in the response categories, only the rankings are compared. We can see that the heightening and strengthening of levees occupies first place in every sample, though reforestation was also mentioned by an almost equal number of respondents in the two Tisza Valley samples. Maintenance of the drainage system is ranked second in both the 2001 “non-affected” sub-sample and the 2003 national sample, while it is assigned considerably less significance than the heightening and strengthening of levees and reforestation by Tisza Valley inhabitants. Thus, the 2002 and 2003 surveys also support the tendency that the Tisza Valley inhabitants consider the implementation of mitigation measures across the border as more promising than local technical solutions.

Another interesting finding is that, compared to previous investigations, the removal of levees to increase the flood plain is given a much greater emphasis in the 2003 national survey. The reason for the change presumably lies in the fact that the 2003 survey already reflects the new concepts in the national water policy, namely the New Vásárhelyi Plan (focusing on emergency reservoirs). The increasing importance attached to the role of the local population is also an interesting new development. According to the 2003 national survey, informing the local population is about as important as the development of water management authorities.

### Views on the New Vásárhelyi Plan

As mentioned earlier, the Hungarian government developed the concept of the New Vásárhelyi Plan in the wake of the 2001 flood in the Bereg region. The building of emergency reservoirs gave rise to the usual dilemmas regarding the siting of facilities. How should the site for a facility be selected? Who would benefit from the new facility and who would bear the losses? Should efficiency or fairness be prioritized, and what other criteria should be applied? Who should be involved in the decision making, and who should have the final word? Should the host community and/or affected individuals be compensated for their losses, and if so, in what way? In the 2002 Tisza Valley survey (general public and elite groups) and in the 2003 national survey, the respondents were asked about their opinion of the above dilemmas.

First, we offered various alternative criteria for the selection of areas to be inundated. Some maximize efficiency (inundation of least valuable areas, or utilizing areas which mitigate flood waves to the greatest extent), others put the fairness of the decision process in the forefront (agreement by landowners or the local population is the main criterion of selection).

According to Table 14, two considerations, mentioned with similar magnitudes of frequency, play the most important role in *the selection of the areas to be inundated*. Specifically, these are areas where they mitigate the flood waves to the greatest degree and where the least valuable agricultural lands are. For those living along the river the protection of agricultural areas is the prime consideration in the selection (42% named it as the most important criterion), which is followed by the greatest possible mitigation of flood waves (33%). On the other hand, respondents in the national sample put the latter in first place (with 39% saying it is a decisive consideration), followed by the protection of valuable agricultural areas (which is the most important according to 34%). The other criteria of selection (agreement by local population and landowners) were deemed significantly less important, and in this respect the differences between the results of the two data surveys are minor.

The picture obtained from the Tisza Valley elite sample shows a basic similarity with the local population's views. Table 15 shows that the elite groups also tend to focus more on the efficiency of emergency reservoirs instead of seeking an agreement with those affected. But there is a slight difference in the ranking of the efficiency criteria. The total elite sample would select with equal frequency the least valuable agricultural areas and the optimal locations from the point of view of flood control (43%, 43%). In the case of water management experts the respective ratios are 40% and

**Table 14** Criteria for the selection of inundated areas, 2002–2003 (%).

	Tisza Valley 2002	National sample 2003
Where they mitigate flood waves to the greatest extent	33	39
Where the least valuable agricultural areas are	42	34
Where the population of the respective settlement(s) agree	11	14
Where the owners of the area agree	7	9
Such emergency reservoirs should not be built	2	4

**Table 15** Criteria for the selection of inundated areas, 2002 (%).

	Political elite	Economic elite	Cultural elite	Water management elite	Total elite sample
Where they mitigate flood waves to the greatest extent	42	39	42	54	43
Where the least valuable agricultural areas are	43	44	42	40	43
Where the population of the respective settlement(s) agree	10	11	11	3	10
Where the owners of the area agree	2	5	3	3	4
Such emergency reservoirs should not be built	3	1	2	1	2

54%, that is, the opposite of the local (Tisza Valley) population's ranking (42% and 33%). It is noteworthy that the ratio of those whose decisions would be conditional on the agreement of the affected population was lowest among water management experts.

Ninety-seven percent of the 2002 Tisza Valley sample replied in the affirmative to the question of whether they *approve the payment of compensation to owners of inundated areas*. Then we asked for their opinion about two types of compensation. According to one, the state would buy the lands selected to serve as emergency reservoirs, according to the other, owners would be compensated only when and if their lands are inundated. Sixty-one percent of the respondents would approve the purchase of lands, while 39% would approve the occasional compensation.

The ratio of respondents in the elite samples who approve the compensation of landowners is also 97%. At the same time, as Table 16 shows, the ratio of those who approve the purchase of lands is almost the same as the ratio of those who approve occasional compensation. The water management elite is different from other groups in this respect too, with only about 30% supporting the state purchase of the lands in question and 70% supporting occasional compensation.

**Table 16** Views about compensation for temporary inundation of land (2002) (%).

	Political elite	Economic elite	Cultural elite	Water management elite	Total elite sample
Land should be bought from land-owners	54	57	54	30	51
Land-owners should be compensated only when land is inundated	47	43	46	70	49

Another question in the 2002 survey asked whether the interviewees would approve the *permanent inundation of the least valuable agricultural lands in order to diminish flood risks*. Thirty-two percent of the national sample would favour this solution, 60% would support it only if farmers are reimbursed for shortfall of income, while 8% would be against. Our findings concerning this question do not show significant differences by region.

In the case of the elite sample (Table 17), the ratio of clear affirmative is a little higher and that of conditional yes a little lower, that is, 38% would approve permanent inundation and 55% would approve only if there is satisfactory compensation. Water management experts support permanent inundation even more strongly—and compensation less—that is, 46% would vote for inundation without compensation and 46% for inundation with compensation.

**Table 17** Views about the permanent inundation of least valuable agricultural land, 2002 (%)

	Political elite	Economic elite	Cultural elite	Water management elite	Total elite sample
Agrees	32	40	37	46	38
Agrees only if farmers are compensated for losses	62	52	56	46	55
Does not agree	6	8	7	8	7

Another question was: *Whose opinion should be taken into consideration in the selection of the areas to be inundated?* (Table 18). Here we find only a few differences between the Tisza and the national samples. According to those living along the Tisza, the opinion of the water management experts is the most important (94%). Most respondents in the national sample also mentioned them, but the frequency of mention was somewhat lower (89%). Inhabitants of the affected settlements ranked second in both surveys: about two-thirds of the Tisza sample (64%) mentioned them, while, interestingly enough, this figure was higher in the national sample (74%). A significant difference can be seen in terms of trusting academics. Every other respondent in the national sample mentioned them, but only 38% in the Tisza sample, which means that those residing in the affected areas have less confidence in academic experts.

With respect to the importance of *involving local residents in decision making*, we can see in Table 19 that the results of the Tisza sample do not differ considerably from those of the national sample. In both samples about half of the respondents think that agreements should be reached with local residents on the main questions related to the developments, one-third think that, ultimately, in the case of a conflict, those affected

**Table 18** Whose opinion should be taken into consideration when selecting areas to be inundated? (2002–2003) (%).

Actors	Tisza Valley 2002	National sample 2003
Water management experts	94	89
Inhabitants of the affected settlements	64	74
Experts of environmental protection NGOs	54	58
Experts of local governments	55	52
Experts of the Hungarian Academy of Sciences and universities	38	51
Government experts	50	49
Foreign experts	22	20
Politicians	6	5

**Table 19** The preferred form of involving local residents in decision making, 2002–2003 (%).

	Tisza Valley 2002	National sample 2003
The people directly affected should have the opportunity to expound their opinion, but it is not binding on the investor	20	18
Concerning local development projects, agreement should be reached with local residents	47	51
Ultimately, the local residents also have the right of veto concerning a specific project	33	31

should have the right of veto, and only one-fifth believe that the opinion of residents is not binding on the investor. The respondents in the national sample appeared more decided on the question of the need to come to terms with the local residents. However, this difference is around the statistical margin of error, therefore, far-reaching conclusion cannot be drawn.

Among the *expectations* concerning the content of the New Vásárhelyi Plan (Table 20) increasing safety was most frequently mentioned in both samples. Significantly more respondents mentioned this in the national sample, 92%, compared to the 84% in the Tisza Valley sample. The ratio of mention in the two samples was nearly identical, with only insignificant difference, in the case of the creation of new jobs (76% and 79%) and the revival of fishing (72% and 68%). However, those living along the Tisza believe much more in the upswing of tourism (73%) than the country as a whole (59%).

**Table 20** Expected impacts of the Vásárhelyi Plan on the region, 2002–2003 (%).

Impacts	Tisza Valley 2002	National sample 2003
Life along the river will be safe	84	92
New jobs will be created	76	79
Fishing will revive	72	68
Tourism will flourish	73	59
It will not have perceivable impacts	10	4

## CONCLUSIONS

Investigations carried out in 1999 indicate that in high flood-risk regions, the inhabitants' knowledge of floods surpasses that of those living in less affected areas. The former are more aware of local defence and evacuation plans and have a more exact knowledge of proper actions in the event of emergency. Results of the survey also show that those who have personal experience of a flood are more likely to feel competent to take action than those who do not have such experience. The study (together with subsequent surveys) confirms the hypothesis that while the perceptions of the residents of high-risk settlements in the Tisza Valley are shaped by their experiences of floods, those of the country's population are influenced mostly by the national media. The differences in perceptions are reflected in the marked differences in opinion concerning mitigation strategies.



The findings of the 2001 survey underline that the public attributes the increase of flood damages mostly to the shortcomings of flood defence structures, unsuitable land use practices, and the loss of ecological equilibrium. They primarily hold the Hungarian Government, the governments of the neighbouring countries and the local governments responsible for these problems, hardly ever raising the responsibility of the local population. Accordingly, most suggest the development of the levees and drainage systems, reforestation in catchment areas and the denial of building permits in high-risk areas to mitigate flood impacts. It is an interesting tendency that while those living in high-risk areas urge international-level ecological intervention, those living in safe areas prefer the local implementation of technical and legal measures.

The most important tendency unfolding in the surveys carried out after 2001 is that, while those living along the Tisza continue to put international solutions at the forefront, the country's population continues to consider local measures to be the main way in which flood losses may be decreased. At the same time, it is an important change that the general public has become more ready to accept ecological measures, e.g. the relocation of levees and the widening of riverbeds, in addition to technical solutions. This can, probably, be attributed to the appearance of the new concept elaborated in the New Vásárhelyi Plan and its communication by the administration. A further important change in public opinion concerns the upgrading of the local population's role in mitigation. Moreover, their information and better preparation are considered to be just as important as the development of water management organizations.

Responses concerning emergency reservoirs and permanent inundation indicate that the overwhelming majority would support the inundation of agricultural areas both during emergencies and permanently. Most would not demand as a precondition the prior agreement of landowners or the affected communities, but would optimize selection based on flood control considerations. In the selection of the areas to be inundated, the national public would put greater emphasis on flood control considerations, while inhabitants of the Tisza Valley region would give priority to agricultural considerations. There is general agreement that landowners should be compensated for losses due to inundation, but opinions regarding the nature of suitable compensation differ widely.

In selecting the areas to be inundated, the public of both the country and the Tisza Valley region would mainly take the advice of water experts, but the opinion of local residents also carries great weight. It is noteworthy that more than two-thirds of both samples would take into consideration the opinion of the affected population and more than half would involve the representatives of local governments and environmental protection NGOs in decision-making.

It is interesting that while respondents in the Tisza sample would give relatively greater weight to the opinion of water management experts, those in the national sample would guarantee the local population a relatively greater voice in decision making. Another interesting result is that the national public opinion expects the New Vásárhelyi Plan to increase safety, while local residents put relatively less emphasis on it; on the other hand, their expectations concerning economic development (particularly the upswing of tourism) are more optimistic.

Finally, a very important finding is that in many respects the views of the population differ fundamentally from those of the elite groups, especially the water

management experts. This, too, underlines the importance of having the alternative flood risk management policies studied not only from the perspective of technical rational, but also from that of social acceptability before any decision is made.

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